ASSIGNMENT 6

Textbook Assignment: "Boilers." Pages 12-14 through 12-37.

6-1. Boiler firesides are inspected for signs of damage and deterioration when the boiler is secured for fireside cleaning. At what other intervals should this type of inspection be performed?

1. Each day the boiler is secured
2. Each time the boiler is secured
3. When material inspection is inevitable
4. When NAVFAC requests an inspection

6-2. Slag is injurious to refractories chiefly because it results in which of the following problems?

1. Cracking of the refractories
2. Filling of expansion joints
3. Peeling off a portion of the refractory surface
4. Powdering of the refractories

6-3. Increasing the temperature of a furnace at an excessively rapid rate is likely to result in what type of problem?

1. Burner cone sag
2. Anchor bolt shrinkage
3. Firebrick breakage at the anchor bolts
4. Deep firebrick fractures

6-4. An improperly closed expansion joint has which of the following indications?

1. Excessive slag formation near the joint
2. A light discolored surface inside the joint
3. Deep fissures in the firebrick adjacent to the joint
4. A dark discolored surface inside the joint

6-5. A plastic burner front is inspected after its first firing period. Which of the following conditions indicate(s) defective workmanship?

1. Radial cracks only
2. Parallel cracks only
3. Radial and parallel cracks
4. Fallen slabs of plastic from the burner front surface

6-6. What are the two most likely causes of failure in a castable burner front surface that has recently been installed?

1. Partial set of the material before installation and too much water in mixing
2. Too much water in mixing and long storage in a place that is too dry
3. Too little water in mixing and long storage in a place that is too dry
4. Partial set of the material before installation and too little water in mixing

6-7. What condition(s) contribute(s) to the damage of boiler refractories?

1. Poor boiler operating procedures only
2. Severe boiler operating conditions only
3. Poor boiler operating procedures or severe boiler operating conditions
4. Failure to remove all crumbly material from a castable burner front when installed

6-8. Under which, if any, of the following conditions may a boiler be steamed with married tubes?

1. The married tubes are 1 inch in diameter, are located in the main generating bank, and are tight under hydrostatic test
2. The married tubes are 2 inches in diameter and are located in the fire row
3. The married tubes are 1 inch in diameter, are located in the main tube bank, and leave a gas passage of 2 inches to the superheater
4. None of the above

Tube Defect	Appearance	Usual Causes	Typical Locations
Circumferential grooving	Bands or strips around the circumference	1. Tube seat leakage 2. Dampened soot deposits on horizontal drums or headers	1. Header ends of horizontal tubes 2. Vertical generating tubes
A	Deep, irregular, straight-walled cavities	1. Leakage of water entrapped between tube metal and surrounding refractory 2. Improper drying of boiler firesides after washing	Header ends of waterwall tubes and division wall tubes that are surrounded by refractory
B	Wandering, straight-walled, canyonlike cavities	1. Leakage of water entrapped between tube metal and surrounding refractory 2. Improper drying of boiler firesides after washing	Header ends of waterwall tubes and division wall tubes that are surrounded by refractory
General fireside thinning	Uniform loss of metal over a relatively large area	G	1. Superheater tube ends between headers and seal plates 2. Water drum ends of generating tubes
C	E	1. Waterside deposits 2. Dry or steam-bound tube	Anywhere
D	F	Steam jets	Anywhere

Figure 6A

IN ANSWERING QUESTIONS 6-12 THROUGH 6-17, REFER TO FIGURE 6A.

6-9. When a blistered tube suggests a waterside deposit, the nature and extant of this deposit can be determined in what manner?

1. By punching the tube with tube cleaning equipment and inspecting the substance loosened by the wire brush
2. By hitting the blister a sharp blow with a hammer and inspecting the particles knocked loose
3. By removing the tube and an adjacent tube, splitting both, and comparing them
4. By removing the tube, splitting it, and examining the watersides of the blistered tube

6-10. By what means can you measure the amount of enlargement of a tube if calipers are not available to you?

1. A micrometer
2. A section of string and a ruler
3. A depth gauge
4. A straight pin through a 3- by 5-inch card

6-11. What is the most common cause of circumferential grooving on a superheater?

1. Leaking of the economizer plugs
2. Leaking of the tube seats in the top pass of the superheater
3. Soot deposits around the tubes where they enter the headers
4. Water washing the firesides without properly drying them

6-12. What tube defects should be entered in spaces A and B?

1. Craters and water tracks
2. Fireside burning and craters
3. Steam gouging and fireside burning
4. Water tracks and steam gouging

6-13. At what point does cratering and water tracking occur almost exclusively?

1. On the fire row tubes
2. On the tube ends at the water drum
3. At the header ends of the waterwall tubes
4. At the steam end of the waterwall tubes

6-14. What information should be entered in space G?

1. Tube seat leakage
2. Soot or vanadium corrosion
3. Improper drying of boiler firesides after washing
4. Steam jets

6-15. What appearance should be entered in space F?

1. Irregular, smooth-surfaced cavities
2. Coarse, brittle tube metal
3. Uniform loss of metal over a small area
4. Bands around the circumference

6-16. What tube defects should be entered in spaces C and D?

1. Craters and steam gouging
2. Fireside burning and steam gouging
3. Steam gouging and water tracks
4. Water tracks and craters

6-17. What appearance should be entered in space E?

1. Irregular, smooth-surface cavities
2. Coarse, brittle tube metal
3. Uniform loss of metal over a small area
4. Irregular, straight-wall cavities

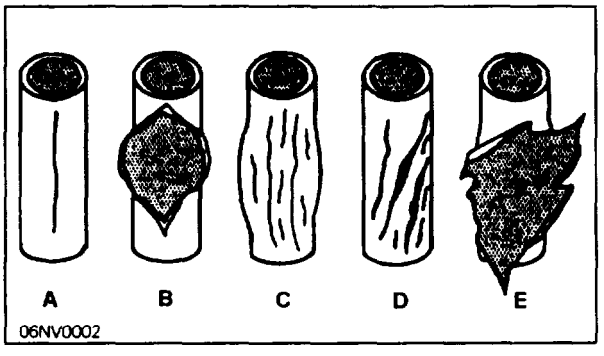

Figure 6B

IN ANSWERING QUESTIONS 6-18 THROUGH 6-21, REFER TO FIGURE 6B.

6-18. What casualties are NOT necessarily caused by overheating?

1. A, C
2. A, E
3. B, D
4. C, E

6-19. What casualty is caused by the most severe overheating?

1. A
2. B
3. D
4. E

6-20. What type of rupture is common in generating tubes?

1. B
2. C
3. D
4. E

6-21. What casualty results from the least severe overheating?

1. B
2. C
3. D
4. E

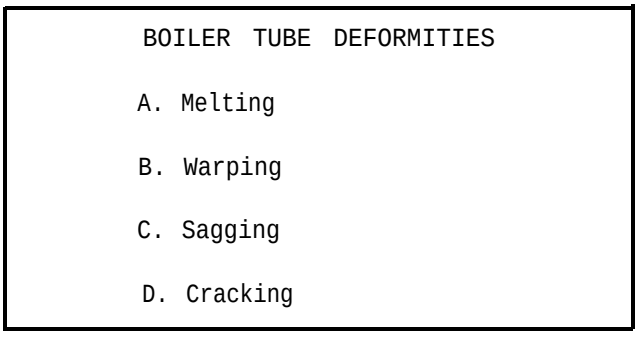

Figure 6C

IN ANSWERING QUESTIONS 6-22 THROUGH 6-25, REFER TO FIGURE 6C.

6-22. Very mild overheating for a short period of time:

1. A
2. B
3. C
4. D

6-23. Caused by a mechanical process, such as flexing:

1. A
2. B
3. C
4. D

6-24. Low water for an extended period of time at high furnace temperatures:

1. D
2. C
3. B
4. A

6-25. Sudden cooling of overheated tubes:

1. D
2. C
3. B
4. A

6-26. Improper fabrication of tubes is most likely to result in which of the following conditions?

1. Upset tubes
2. Swaging
3. Wall lamination
4. Mechanical fatigue cracks

6-27. The basic reason for tube failure caused by fireside and waterside deposits is that the deposits result in which of the following conditions?

1. Oxygen pitting
2. Tube wall lamination
3. Localized overheating
4. Tube abrasion

6-28. Abundant water combining with soot on firesides of tubes may result in the formation of what substance?

1. Slag
2. Iron oxide
3. Ferrous sulfate
4. Saltlike granules

6-29. Steam drum protection plates are most likely to be damaged when what condition exists?

1. Gas passages are clogged
2. Superheater is overfired
3. Steam pressure is formed too fast
4. Brickwork adjacent to the superheater headers is damaged

6-30. When testing the functions of automatically or manually controlled devices that interfere with steam distribution, you should ensure that which of the following main distribution valves is/are closed?

1. Gas only
2. Gas and water
3. Main steam
4. Water and steam

6-31. When CO_2 or O_2 measuring devices are not available, you can use which of the following indications as a guide for checking the air-fuel ratio on a small boiler?

1. Fuel consumption
2. Draft gauge
3. Feedwater consumption
4. Appearance of the fire

6-32. On a fully automatic boiler, you can check the flame failure and combustion air failure devices in which of the following ways?

1. By simulating a flame failure manually
2. By observing the complete programmed sequence cycle
3. By simulating a low-water condition
4. By bypassing the draft controller

6-33. With respect to steam and water piping, you should look for which of the following conditions during an inspection?

1. Excessive expansion and contraction
2. Undue vibration in piping connections to the boiler
3. Leaking water column connections
4. Each of the above

6-34. What is the best method for determining proper operation of high- and low-water alarms?

1. Open the surface blowdown valve momentarily
2. Blow down the water column with steam on the boiler only
3. Observe the action of the water during blowdown of the gauge glass only
4. Blow down the water column with steam on the boiler and observe the action of the water during blowdown of the gauge glass

6-35. Of the following steps, which one should you take to test the operation of a float-activated low-water fuel cutoff device?

1. Drain the float bowl to the low-water level
2. Close the fuel oil solenoid valve
3. Blow down the steam drum
4. Disconnect the low-water control circuitry

6-36. Normally, a temperature controlled low-water fuel cutoff device responds to an increase in temperature inside the boiler under which of the following circumstances?

1. Stack temperature is excessively high
2. Water drops to a predetermined level
3. Steam pressure is no more than 2 percent above normal
4. Water temperature rises uniformly to the steaming level

6-37. When testing blowoff valves, you should open the valves for a few seconds to check for which of the following conditions?

1. Back pressure
2. Valve wear only
3. Restrictions only
4. Valve wear and restrictions

6-38. To check the blowoff setting of safety valves and water-pressure relief valves, you should perform which, if any, of the following actions?

1. Raise boiler pressure slowly to the blowoff pressure
2. Manually raise the valve
3. Gag all safety and relief valves
4. None of the above

6-39. A properly functioning single safety valve on a steam boiler that has a maximum allowable working pressure of 150 psi should reseat tightly at what minimum pressure?

1. 144 psi
2. 124 psi
3. 104 psi
4. 84 psi

6-40. What should be the individual settings of two pressure relief valves on a hot-water boiler having a maximum allowable working pressure of 100 psi?

1. One at 125 psi, the other at 100 psi maximum
2. Both at 110 psi
3. One at 150 psi, the other at 110 psi
4. One at 120 psi maximum, the other at 100 psi

6-41. A properly set single, pressure relief valve on a boiler with a maximum allowable working pressure of 80 psi should reseat tightly with a blowdown of what maximum pressure?

1. 15 psi
2. 20 psi
3. 25 psi
4. 30 psi

6-42. Under certain conditions, which of the following factors can be used to determine safety valve capacity?

1. Operating pressure
2. Maximum steam generating capacity only
3. Maximum evaporative capacity only
4. Maximum steam generating capacity or maximum evaporative capacity

6-43. Venting should be held to a minimum to preclude what condition in the feedwater?

1. Deaerator venting
2. Hydrogen entrainment
3. Oxygen entrainment
4. Oxygen venting

6-44. As a boiler plant supervisor, you should be able to identify which of the following indications of trouble?

1. Strange noises
2. Unusual vibrations
3. Abnormal temperatures
4. Each of the above

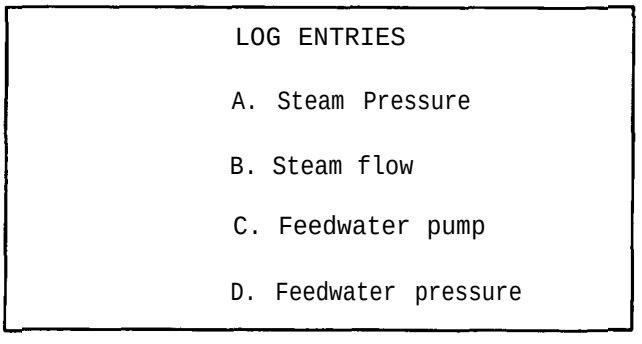

Figure 6D

IN ANSWERING QUESTIONS 6-45 THROUGH 6-47, REFER TO FIGURE 6D.

6-45. Actual output recorded in pounds per hour to obtain steam flow:

1. A
2. B
3. C
4. D

6-46. Proper deaerating temperature being maintained in the heater:

1. A
2. B
3. C
4. D

6-47. Effectiveness of the boiler feed pumps:

1. D
2. C
3. B
4. A

6-48. With other conditions constant, a decrease in what type of draft indicates leaking baffles?

1. Last pass
2. Mechanical
3. Forced
4. Furnace

6-49. What reading(s) is/are an indication that heat is being lost by way of the stack?

1. Percentage of CO_2 flue gas
2. Flue-gas temperature
3. Soot-blown time and blowdown
4. Hot-water supply temperature and blowdown

6-50. What type(s) of fuel consumption is/are determined by use of a measuring stick?

1. Gallons of oil
2. Pounds of coal only
3. Cubic feet of gas only
4. Pounds of coal and cubic feet of gas

6-51. The hot-water supply temperature should be recorded because insufficiently heated water can cause which of the following conditions?

1. Abnormal soot deposits
2. Hammer knock in a steaming boiler
3. Deposits or scaling in a boiler
4. Large amounts of chemicals to accumulate in the feedwater

6-52. In what log column should you record the date a boiler was drained and washed?

1. Remarks
2. Makeup water
3. Water pressure
4. Soot-blown time and blowdown

6-53. An operator coming on duty should perform an operational inspection for which of the following reasons?

1. To ensure the boiler water level is correct
2. To ensure the system is operating normally
3. To ensure sufficient fuel is available
4. To ensure the boiler room is clean

6-54. The technical library should contain current Navy publications pertaining to your boiler plant and which, if any, of the following manuals?

1. Specific plant manufacturer's manual
2. General plant manufacturer's manual
3. Army boiler operation and repair technical manuals
4. None of the above

6-55. What term is commonly used to describe the universal solvent?

1. Oxygen
2. Water
3. Sodium phosphate
4. Caustic soda

6-56. A glass of tap water at 77°F contains a total of how many ppm of oxygen?

1. 7.5
2. 7.8
3. 8.2
4. 9.0

6-57. To prevent corrosion damage to metal in the interior of the boiler, you should perform which of the following actions?

1. Paint the interior metal surfaces
2. Chemically treat the feedwater only
3. Chemically treat the boiler water only
4. Chemically treat the feedwater and the boiler water

6-58. What is the term used for deposits on tubes and other internal surfaces caused by calcium salts, magnesium salts, and other insoluble materials?

1. Deposits
2. Scales
3. Crystals
4. Solids

6-59. Chemical treatment of boiler water causes scale-forming substances in what form?

1. Scale deposits
2. Fluid sludge
3. Carbonate of sulfate
4. Caustic soda

6-60. When required to treat boiler water containing calcium, you should use what chemical?

1. Sodium phosphate
2. Calcium phosphate
3. Calcium silicate
4. Sodium silicate

6-61. What sludge conditioner is the only dispersant approved by NAVFAC?

1. Magnesium silicate
2. Calcium sulfate
3. Sodium phosphate
4. Quebracho tannin

6-62. A small amount of seawater in the feedwater causes which, if any, of the following conditions inside a boiler?

1. Steam carry-over
2. Baked sludge
3. Heavy sludge
4. None of the above

6-63. What chemical should you add to boiler water to raise the pH value?

1. Iron oxide
2. Caustic soda
3. Sodium sulfite
4. Tannin

6-64. What chemical is often referred to as an oxygen scavenger?

1. Iron oxide
2. Caustic soda
3. Sodium sulfite
4. Tannin

6-65. Feedwater or makeup water tanks should be maintained within what temperature range?

1. 125°F to 135°F
2. 140°F to 160°F
3. 165°F to 175°F
4. 180°F to 200°F

6-66. The production of froth or unbroken bubbles on the surface of the boiler water is known by what term?

1. Foaming
2. Steam production
3. Alkalinity
4. Scum

6-67. What condition(s) in a boiler make(s) it difficult, or quite often impossible, to read the true level of boiler water on the gauge glass?

1. Foaming only
2. Priming only
3. Foaming or priming
4. Bumping or priming

6-68. What two types of solids are present in most boiler water?

1. Dissolved and gloating
2. Suspended and floating
3. Dissolved and scale-forming
4. Suspended and dissolved

6-69. The continuous blowdown should be regulated to maintain what ppm of TDS in a steaming boiler?

1. 2,000 to 3,000
2. 3,000 to 4,000
3. 4,000 to 5,000
4. 5,000 to 6,000

6-70. One boiler horsepower produces a total of how many pounds of steam per hour?

1. 3.450
2. 34.50
3. 345.0
4. 3,450

6-71. Once the boiler has stabilized and treatment test results remain reasonably balanced, you should conduct testing at what intervals, in hours?

1. 1
2. 2
3. 3
4. 4